4

AN

ABSTRACT

OF AN

ESSAY

ON

Tillage *and* Vegetation,

BEING

The HORSE-HOING HUSBANDRY
Explained, and made eaſy to be underſtood by the
PRACTISING FARMER:

CONTAINING

Many Uſeful Obſervations in Huſbandry,

WHICH
Very greatly increaſe the Product of the Corn-Fields, and at the ſame time very much leſſen the common Expences.

C

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PREFACE.

W*HEN the Propoſals for this Book were firſt publiſhed, which was in* January, 1745-6, *the Whole was deſign'd to be ſent to the Preſs in a few Months: But it was ſoon perceived, that the Perſons, for whoſe Uſe this Work was more particulary intended, were not to be ſatisfied or pleaſed with Arguments of Reaſon, howſoever clear and demonſtrative; but expected more poſitive Aſſurance of the Succeſs from Practice. The Author therefore put a Stop to the advertiſing his Propoſals, and reſolved to ſtay till a little further Practice might enable him to affirm ſomewhat more poſitively from his own certain Knowledge and Experiment, concerning the Produce or Crop of a whole Field cultivated in this Way.*

But as ſeveral of his Friends had favoured him by ſubſcribing, and ſome others unkindly inſinuated that the Book would never come out, he therefore determined to publiſh this Abſtract or Epitome, to be given gratis *to his Subſcribers, as a Specimen of the Work, to obviate the Impatience of ſome, and to make them all ſome Amends for keeping them in Expectation ſo long. The Reader will find ſeveral Points here run over in a very haſty and ſummary Way, and many Things only juſt mentioned which ſhould be further explained; all theſe Points will be treated upon at large, and particularly every Thing relating to the Practice and Management of Land in this Way. And many Other uſefull Obſervations will be inſerted, concerning the Cultivating of ſeveral different Sorts of Plants* *and Seeds, which by this Way of continual Tillage may be raiſed and brought to great Perfection in the plough'd Fields.*

The Reader is therefore deſired to conſider, that this Tract is deſigned for no more than an Epitome of what is intended for a much larger and more compleat Work upon this Subject.

By this Delay the Author will be more fully ſatisfy'd concerning ſome Points, of which he would be glad to ſpeak a little more poſitively from his own certain Experience. He has been alſo promiſed ſome more certain Information of the late Mr. Tull, *and the Succeſs of his Practice, of which there have been ſo many various and contradictory Reports. And therefore, by this Delay, the Work will be improved with ſeveral uſefull Additions, by which it will be made much more perfect and compleat; and the Subſcribers will in all probability be much better pleaſed, than if it had been haſtily finiſhed, according to their firſt Expectation.*

And as it has been a frequent and juſt Complaint, that Books publiſhed by Subſcription have often been ſold cheaper afterwards to thoſe who never gave any Encouragement to the Work, than to the Subſcribers themſelves; the Author does here promiſe and engage himſelf, that when the Subſcription is cloſed, the Book ſhall never be ſold for leſs than a Guinea, while he lives.

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OF
TILLAGE
AND
VEGETATION.

BOOK I.

CHAP. I. *The Introduction.*

§ 1. AS this Treatiſe is deſigned chiefly for the Uſe and Improvement of the practiſing Farmer, it ſhall be made as plain and eaſy to be underſtood as poſſible: And therefore the cleareſt Expreſſions and plaineſt Words will every where be uſed, and all Words of doubtful Signification, and Words not generally underſtood, will be cautiouſly avoided.

This Book is deſigned to be written in a plain and eaſy Stile.

Power of Prejudice.

§ 2. When we conſider the prodigious Power of Prejudice, it will be no Wonder that the Improvements in Huſbandry, which are to be the Subject of this Treatiſe, ſhould meet with ſo much Oppoſition, and find ſo little Credit among Huſbandmen in general; (though they are as certainly and demonſtratively proved, as any Propoſitions in Mathematicks.) It is hardly to be expected that Huſbandmen, brought up from their Infancy in Practices different, and appearing to them directly contrary to theſe, ſhould give up their old Opinions at once, to what they look upon as a ridiculous Novelty. Who ſhall perſuade a Man preſently to believe, that he and his Fore-fathers have been in the wrong Way for Ages; or that the Methods practiſed by his Anceſtors, and which he has learned and practiſed from his Youth up, are not the beſt Methods which ever were, or could be invented? Theſe Opinions were the earlieſt Furniture of his Mind, they got the firſt Poſſeſſion there, and they will not eaſily give place to New-Comers.

Every Invention or Improvement has ſuffer'd the Imputation of Novelty.

§ 3. Thus every Invention, every Diſcovery, and every Improvement, has, in its Turn, undergone the Imputation of Novelty and Whimſicalneſs. And as ſeveral pretended Diſcoveries have been found to be but fantaſtical and chimerical Projects, ſo every real and uſeful Diſcovery muſt expect to undergo a ſevere Examination and Trial, before it can be acknowledged and approved. But every Truth that can be demonſtrated by Number, Weight, and Meaſure, the more it is examined and inquired into, the more ſure and certain Aſſent it will gain in every rational Mind. But,

§ 4. To

Prejudices muſt be removed to make Way for Truth.

§ 4. To make Way for the Reception of Truth, Prejudices muſt be removed out of the Mind: But theſe being the firſt Original, and earlieſt Furniture of the Place, they are not eaſily to be got out, Men cannot part with them but with Reluctance; they are ſo fixed in their Places, that they can ſcarce be removed without damaging the Building: And many times, when they are thought to be cleared away, they return again, as it were by Inchantment, and juſtle out the New-Comers. They are like thoſe Weeds, which being the firſt Production of the Soil, they get ſuch Poſſeſſion, that it is no eaſy Taſk to root them out; and when with much Pains and Labour you think you have well nigh cleared the Ground of them, they ſpring again from the old Roots, and over-power the tender Plants you would cultivate in their Room. So fares it with Truth, when the Mind is prepoſſeſs'd with Prejudices againſt it.

The Horſe-hoing Huſbandry muſt be approved of when underſtood.

§ 5. The Succeſs of theſe Improvements in Huſbandry is as clear and certain as any ſelf-evident Propoſition: But before we can give our Aſſent to a ſelf-evident Propoſition, it muſt be propoſed to us in ſuch Terms as we can underſtand. There are many mathematical Demonſtrations which no rational Man can deny his Aſſent to, when the Steps, by which they are to be demonſtrated, are ſhewn and explained to him: But yet the Truth of ſuch Propoſitions is far from being clear and plain to thoſe Perſons, who underſtand not the Methods by which ſuch Propoſitions are to be demonſtrated.

§ 6. This

The Deſign.

§ 6. This then is the Deſign, and this will be the Subject of the following Sheets; to endeavour to remove ſuch Prejudices, by proving theſe following Points in the moſt plain and eaſy Way. And I hope I ſhall be able fully to ſhew, that they are certain and evident Truths, as clearly proved and demonſtrated as any mathematical Truths can be.

The Method propoſed.

§ 7. Theſe three Propoſitions are particularly recommended to the Conſideration of the Reader:

Firſt, That continual Summer Tillage is a great Improvement to all Sorts of Land.

Secondly, That Wheat and all Sorts of Corn may be ſown in Rows or Furrows, in ſuch a Manner as to admit of continual Summer Tillage while the Crop is growing.

Thirdly, That a much leſs Proportion of Seed Corn, than is uſually ſown, is ſufficient to produce better Crops than Farmers generally get upon their beſt Land.

And conſequently, that Land may be kept in an improving Condition; as good, and better, or more profitable Crops produced; and that at much leſs Expence than in the common Practice of Huſbandry. And firſt of Tillage in general.

CHAP. II. *Of Tillage in General.*

What is meant by Tillage.

§ 1. By the general Term of *Tillage*, is meant every Method of breaking, dividing, turning, or ſtirring of the Earth, either by the Spade, Plough, Hoe, Shim, or any other Inſtrument that has yet been invented, or may be invented hereafter for that Purpoſe.

§ 2. Huſ-

Some Men think that Land may be ploughed too much.

§ 2. Huſbandmen are very much divided in their Opinions concerning the proper and neceſſary Degrees of Tillage, for different Sorts of Land. They are generally governed by the Cuſtom of the Place where they live, let the Soil be what it will: In ſome Places, and on ſome Sort of Land, Neceſſity forces them, and they muſt make Summer Fallows, whether they will or no; becauſe if they were to ſow ſuch Land every Year, it would be ſo worn out in five or ſix Years, that, notwithſtanding all the Dung they can get to lay upon it, it would produce no Corn at all: In ſome Places therefore, they give their Land a Summer Fallow every third Year, in other Parts once in four Years, and in ſome Places, where they think the Land will bear it, they ſow it every Year, and never fallow it at all. And many old Farmers, who have lived all their Lives where the Land is pretty good, and where they have been uſed to ſow it every Year, are in Doubt if Summer Ploughing would not do their Land more Harm than Good. Nay, ſome of them will poſitively affirm, That Land may be ploughed too much: And this we find to be the Opinion of many Farmers in different Parts of *England*, that on ſeveral Sorts of Land, too much Ploughing will do more Harm than Good. If they did not ſpeak their Mind in this Point very gravely and ſeriouſly, one might think they were in jeſt, and that they meant it in a bantering Way; as ſome People mean when they ſay, that *Pepper, if it be beat too fine, is Poiſon*; by which they would be underſtood to mean, that it cannot be made too fine. But theſe Huſbandmen ſpeak ſoberly when they ſay, that Land may be made too fine by Tillage; and that it may be too much ploughed; and that too much Ploughing will do more Harm than Good.

No Land can be made too fine by Tillage.

§ 3. Whereas if theſe Men would but make proper Obſervations from their own Experience, they would ſoon be convinced, that no Sort of Land can ever be made too fine by Tillage. *Solomon* knew very well what he ſaid, when, among many excellent Sentences of Wiſdom, he gave us theſe: *Much Food is in the Tillage of the Poor*, Prov. xiii. 23. And Chap. xxviii. 19. *He that tilleth his Land, ſhall have Plenty of Bread.* And it may be ſafely affirmed for a certain and never-failing Truth, that the oftner Land is ſtirred or turned with the Spade, Plough, or other Inſtruments of Tillage, the *richer* and *more fertile* it will be: And this will be found true of all Sorts of Land, without Exception. This I ſhall prove as clearly as any Point can be proved by Arguments of Reaſon. And any Farmer may prove it more fully to his own Satisfaction, by ſome eaſy Experiments, and at little or no Expence; or rather he may be ſure to be a Gainer by the very Experiment.

An Experiment propoſed.

§ 4. Any one that has an Inclination to try, let him make a *Summer Fallow* of one Acre of Land, and divide it into five or ſix or more Breadths, or narrow Lands, and plough one of them *twice*; the next *four Times*; the third *ſix Times*; the fourth again but *twice*; the fifth *four Times*; the ſixth *ſix Times*; and ſo on, if he pleaſes to make any more Diviſions. Then ſow it altogether alike, and he will ſee plainly enough by the future Crops, which is the beſt Method: And he will certainly be convinced, that if he takes proper Care to deſtroy the Weeds, then the more he ploughs his Land, the more his Corn will flouriſh and proſper, and he will find that there is no Danger of plowing Land too much; for thoſe Parts of his Field which were moſt ploughed, he will find to produce the beſt Crops, and that for ſeveral Years after.

This is proved by the Practice of Gardening.

§ 5. The Truth of this is alſo confirmed to us beyond all Doubt, by conſtant Experience in all the Practice of Gardening; for let the original Soil be what it will, Chalk, Sand, Gravel, Clay, richer or poorer, when it is converted into a Garden, in a very few Years, by the Operation of the Spade and Hoe, it becomes many Degrees richer and more fertile than the neighbouring Corn Fields of the ſame Soil.

All Gardens are richer than the Corn Fields, and that without Dung.

§ 6. If Gardens then are generally obſerved to be richer than the Corn Fields, what is it that makes them ſo? Is it not Tillage? There is no Conjuration in the Name of a Garden, to make it better Earth, than the adjacent Fields of the ſame Soil; neither is it owing to Dung and Mould, or any other Mixtures of Earth, brought at great Expence, and laid on upon the original Soil; for generally the Corn Fields are dunged much oftener than Gardens.

Some beſtow much Dung upon their Gardens.

§ 7. It is true indeed, that ſome Gentlemen who have Money enough and are willing to diſpoſe of it thus, have beſtowed very great Charges in bringing Dung and Mould in conſiderable Quantities to lay upon their Gardens.

But this is not the Caſe of Gardens in general.

§ 8. But this is not the Caſe of Gardens in general, and yet all Gardens are richer than the Corn

Fields. There are many Inſtances of Gardens where no Dung has been laid for twenty or thirty Years, and yet ſuch Gardens continue to be richer and more fertile than the neighbouring Fields; and the more Digging and Hoing, and Killing of Weeds, ſtill the more fertile they are: And yet in many Places, the adjacent Fields of the ſame Soil are dunged once in five or ſix Years, and ſome oftner.

Inſtance of a Garden not dunged for 17 Years.

§ 9. There is a Garden in this Neighbourhood, where the natural Soil is Chalk, and not very rich: This Garden is certainly known not to have been dunged in ſeventeen Years laſt paſt, and for what any body knows, not for many Years before that; and the adjacent Corn Fields all round it are known to have been dunged once in five or ſix Years: And yet this Garden, by digging, hoing, and being kept pretty clean from Weeds, by the Benefit of of this Tillage, without Dung, is ſtill richer than thoſe Fields. If the Farmer would but lay aſide his Prejudices, and make a little good Uſe of a common Underſtanding, he would ſoon find out this ſeeming Myſtery; which is no more than this, that the Garden is generally kept cleaner from Weeds, by digging and hoing, and ſuch Sort of Work, than the Fields; and the Plants that are cultivated in the Garden are generally ſo diſpoſed and ſet out to ſuch proper Diſtances, as to admit of digging or hoing all the Summer, while the Plants are growing; whereas the Corn in the Fields is generally ſown at random, all over the Ground, in ſuch a Manner that it is impoſſible for the Land to have the Benefit of any Sort of Tillage, or the Earth to be ſtirred at all, till after Harveſt, that the Crop is got off; and then moſt of the Land that had Wheat upon it, lies unploughed till *Chriſtmas*, and ſometimes longer: No Wonder if ſuch Land is impoveriſhed for Want of Tillage, exhauſted by a Crop of Corn and Weeds, and the Earth never moved for twelve or fourteen Months.

The Reaſon why Wheat is falſly ſuppoſed to exhauſt the Land more than other Corn.

§ 10. And this is the Reaſon that a Crop of Wheat is ſuppoſed to draw out of the Land more of its Strength and Richneſs, or as they generally call it, to ſoke the Land, more than Barley, Beans, or Peaſe; whereas in Truth any of thoſe Crops require as much of the Richneſs of the Earth, for the Time they are growing upon it, as the Wheat; but the Wheat being almoſt a Year from the Time of ſowing, to the Time of its being ripe and fit to cut, and the Ground all that Time not ſtirred, to raiſe any freſh Nouriſhment for it, ſuch Land is therefore in a much worſe Condition for any Crop to come after Wheat, than after Beans, Peaſe, *&c.* for thoſe Sorts of Grain being uſually ſown in Rows or Furrows, and kept tolerably clean from Weeds for ſome Part of the Summer, by hoing, ſhimming, or ſome ſuch Sort of Work, this little Summer-Tillage is ſome Preparation for a ſucceeding Crop.

If a Garden was to lay like a Piece of Wheat, it would be impoveriſhed like the Fields.

§ 11. If the Ground in a Garden was to lay for a whole Year without any Sort of Tillage, in the ſame Condition as a Field of Wheat, over-ſtock'd with Plants, and as full of Weeds as Wheat generally is, ſuch a Garden would be impoveriſhed, and brought in as much Want of Dung, as the Corn Fields generally are.

But Plants in Gardens always leave Room for Tillage.

§ 12. But Every-body knows that Gardens are managed in a very different Manner: The moſt ſlovenly Gardener never lets any Part of his Ground lie a whole Year in ſuch a ruinous Condition, as the Corn Fields with a Crop of Wheat: And all Sorts of Plants, cultivated in Gardens, are ſet out (by hoing or otherwiſe) to ſuch proper Diſtances as may admit of ſome Tillage while the Plants are growing. Whoever calls himſelf a Gardener, would be aſhamed to neglect his hoing and killing of Weeds; and let his Onions, Lettuces, or Carrots, lie like the Farmer's Wheat: And this continual Summer Tillage keeps the Ground in Gardens fertile, without the frequent and repeated Help of Dung, which is always thought neceſſary, and is generally beſtowed upon the Corn Fields.

An Objection anſwered.

§ 13. But here the Reader may be apt to think, that though there is ſome Appearance of Reaſon in what has been ſaid, and that it is poſſible, that if a Gardener was to undertake the Management of a ſmall Piece of Wheat or Barley, and hoe it, and clean it from Weeds, and ſet out all the Plants at due Diſtances, as he would his Onions, Carrots, *&c.* he might keep his Land in Heart with leſs Dung; and he might get as good, and may be better Crops than the Farmer. But what is all this to the Purpoſe, ſays the Farmer? Will a Crop of Corn pay the Charges of Gardeners Work; and he that has two or three hundred Acres of Land to till, where ſhall he get Gardeners to do all his Work? *Anſwer:* This is the Deſign, and this is the Advantage of *The Horſe-hoing Huſbandry:* It teaches us to ſet our Plants of Wheat and Barley, or other Corn, at their proper Diſtances, to keep the

Land in Tillage while the Crop is growing, and to hoe and clean, and deſtroy Weeds, without Damage to the Corn: And it ſhews how all this Work may be performed by the Farmer's Servants and Labourers, as well as by the moſt ſkilful Gardeners; and that at much leſs Expence than in the common Practice of Huſbandry. And this will keep the Land in good Condition, with much leſs Dung than is generally thought neceſſary.

But Dung is not deſpiſed when it is to be had at a moderate Expence.

§ 14. Not that I would be underſtood to deſpiſe Dung, when it can conveniently be had, and at a moderate Expence, for Dung is a great Aſſiſtant to Tillage; it is not the Dung, but the Charges of buying and carrying it, that is to be found fault with; and by Summer Tillage the Dung may be made to go much farther: And by many Years Experience, it is found a certain Matter of Fact, that continual Summer Tillage will do pretty well without it. And the moſt experienced Gardeners and curious Floriſts have almoſt baniſhed Dung from their Flower Gardens, and the Nurſeries of their moſt tender Plants; at leaſt till it is thoroughly well rotted and decayed, and converted to fine Earth.

CHAP. III. *Of the Food of Plants.*

Earth is the Nouriſhment of Plants.

§ 1. The true Principles of Tillage and Vegetation have been but little underſtood, even among ſpeculative Men. It has been diſputed by ſome Sort of Philoſophers, what is the real Food or Nouriſhment of Plants. Some have thought that ſeveral Sorts of Plants received their Nouriſhment chiefly from the Air: Others have imagined, that many Kinds of Plants are nouriſhed, almoſt, if not altogether by Water: And ſome Perſons obſerving how much the Heat of the Sun contributes to the Growth of Plants, ſeem to ſuppoſe, that Fire is a conſiderable Part of the Food and Nouriſhment of Plants. It is certain indeed, that no Plant can thrive without Air, and proper Degrees of Heat and Moiſture; and ſo far *Air*, *Water*, and *Fire*, may be ſaid to be neceſſary, to make Plants thrive and flouriſh. But too much Air will dry up, and kill the Roots of a Plant, too much Water will chill and ſtarve them, and too much Heat will burn them; but too much fine Earth can never do Injury to the Roots of any Plant whatſoever.

All Plants by Decay return to Earth.

§ 2. If we examine what a Plant conſiſts of, when by Decay and Putrefaction (that is, by rotting) it returns to its firſt Principles, we ſhall find it will be fine Earth, ſuch as will enter into the Roots of, and nouriſh any other Plant whatſoever, with the proper Degrees of Heat and Moiſture. But whether theſe Elements are tranſmuted or changed from one into the other, that is, whether Earth is changed into Water (as ſome have ſuppoſed) and Water into Air, and Air into Fire; and then Fire, Air, and Water, change and return back to Earth again: This we ſhall leave to the Philoſophers, being not much to our Purpoſe to inquire into.

Even Water Plants are nouriſhed by Earth.

§ 3. If it be examined and tried by proper Experiments, it will be found that every Plant, even thoſe which live altogether in the Water, and are called Water Plants, are fed and nouriſhed by Earth; and by Corruption and Decay, they all return to Earth again. Thus Things are ſaid to *moulder* and decay, and that Subſtance which they return to, or that which remains of them, when they are thoroughly decayed, is generally called *Mould:* And this is what I mean by *pure Earth.*

Nothing but fine Earth can enter the Roots of Plants.

§ 4. By examining the Pores of the Roots (of all Sorts of Plants) which are their Mouths, by which they take in their Food and Nouriſhment, we ſhall find, that the Particles of Earth which they take in, muſt be extremely ſmall; even ſo ſmall as not to be diſcernable by the naked Eye; from whence it is very certain, that the more the Earth is broken and divided, and the finer it is made by Tillage, by frequent and continual Summer Tillage, the more of thoſe fine Parts there will be for the Nouriſhment of whatſoever is planted or ſowed upon it.

Huſbandmen put their whole Truſt in Dung.

§ 5. But let Gardeners and other curious Obſervers think and ſay what they will of the Food and Nouriſhment of Plants: In Dung the Huſbandmen put their whole Truſt and Confidence. They think that Dung is all in all; and that there are in Dung certain rich and fattening Qualities, without which there can be no Succeſs in Huſbandry, and by the Help of which, the Farmer may always be ſure of Plenty. I deſire it may be obſerved here once for all, that when I ſpeak of Farmers in general, I would be underſtood to mean only the generality, or a great many of them; for otherwiſe I know there are among Farmers ſome very intelligent and ſenſible Men, who are as capable of diſtinguiſhing and perceiving the Force of rational Arguments, as Men of any other Profeſſion whatever: And therefore any Man that has had the Advantage of

Education, or that has endeavoured to improve his Underſtanding with uſeful Knowledge, will be very much to blame to take Offence at what I may happen to ſay of the Ignorance or Unſkilfulneſs of Countrymen in general. And I would be ſo far from being thought to ſpeak of, or to treat the Farmers with Contempt, that I look upon them to be as valuable a Set of Men, and as uſeful and neceſſary to human Society, if not more ſo with regard to the Affairs of this Life, than the Men of any Profeſſion whatſoever.

Dung is a great Help to poor Land.

§ 6. As this Tract is written and intended for the Uſe of the practiſing Farmer, and we would not willfully diſoblige the Reader, and make him angry with the Book before he has read it through, which we ſhould certainly do, if we ventured to ſpeak in Contempt of Dung; therefore it ſhall be readily acknowledged, that Land may be enriched very much with Dung, eſpecially ſuch as is uſually called poor Land, and that if the Proprietor or Occupier can and will beſtow a ſufficient Quantity of Dung and Mould, he may make great Improvements upon it: But then I muſt have Leave to ſay, that ſuch Improvements are generally very dear bought. And there are ſome Farmers who will tell you, that they have known as much Charge beſtowed in Dung and Mould upon ſome Pieces of poor hungry Land, as would have purchaſed the Inheritance of it; and yet ſuch Land has been but little the better for all that had been beſtowed upon it.

What is the real Benefit of Dung.

§ 7. But to have a right Notion of this Matter, we ſhould inquire how, and in what Manner the Dung operates upon the Roots of Plants, and how its Richneſs and Fatneſs gets into the Corn.

This is what few Farmers ever trouble themſelves to conſider. Some will talk of the Salts that are in Dung, and what great Virtues there are in the Salts: But how, or in what Manner thoſe Salts do operate upon the Ground, or how they become beneficial to the Corn, this is what I believe very few Farmers will undertake to explain. If they ſuppoſe that the very Salts, or ſaline Particles themſelves, do enter the Roots of Wheat, Barley, and other Corn, in any conſiderable Quantity, and that thoſe Plants are thereby nouriſhed and improved, they may eaſily be convinced of their Miſtake, by applying Salt to the Roots of thoſe Plants, while they are growing, which will certainly kill them; for by many curious Experiments it is found, that all Kinds of Salts are pernicious to the Roots of all Plants: As ſhall be ſhewn more fully hereafter.

Dung does diſſolve and divide the Earth into fine Parts.

§ 8. But not to trouble ourſelves with People who talk in this unintelligible Way, and pretend to be myſterious, when they really know nothing of the Matter: Let us conſider what the real Operation of Dung is, and from whence proceeds the Benefit of it upon Land. And the plain Truth of the Myſtery is only this, that Dung does diſſolve, ſeparate, crumble, and divide the Earth, into very ſmall, and almoſt infinitely minute Parts, ſuch as the Roots of Plants take in for their Nouriſhment: This is the Richneſs, theſe are the fattening Qualities of Dung. There are very few Sorts of Land ſo ſtubborn and untractable, but what will be diſſolved by Dung, and by the Help of Dung and Tillage the ſtiffeſt and moſt binding Soil may be divided, and brought to ſome Degree of Fineneſs; and then ſuch Land will afford Nouriſhment to the Roots of Plants:

Even the Earth which lies below the Staple (that is, below the Depth which is uſually ploughed) which is commonly called *Dead Earth*, and which by itſelf is generally reckoned utterly barren and unprofitable; this cold barren Earth, being dug up, and mixed with Dung, even this, with ſufficient Tillage, will become very rich and fertile.

Plants thrive only by what enters by their Roots.

§ 9. This then may be laid down as a Maxim, or fundamental Principle, that nothing can cauſe a Plant to thrive, or can enlarge or increaſe the Bulk of a Plant, but what can enter into the Roots of it: And conſequently, the finer the Earth is made by Tillage, or by Dung and Tillage both, the more of thoſe fine Parts there will be which can enter into the Roots of Plants; that is, the more Nouriſhment there will be for Corn, and the better Crops it will produce.

An Objection to this anſwer'd.

§ 10. Something like an Objection to this, may be drawn from what has been obſerved by the very ingenious Dr. *Hales*, in his Treatiſe of *Vegetable Staticks*, viz. 'That ſeveral Sorts of Plants are 'found to imbibe Moiſture from the Air, by their 'Leaves and Branches; and that the Branches of 'ſome Plants may be fed with Liquors, which 'they will imbibe at ſome Seaſons of the Year, 'and take in, in great Quantities. And as Water, eſpecially Rain Water and Dews, are found 'to be ever charged with certain Quantities of 'earthy Particles, from hence it will follow, that 'a Plant may be increaſed by the Moiſture it imbibes from the Air.' To this I anſwer, that Wheat or other Corn, upon the pooreſt Land, will have the ſame Advantages from the Moiſture of the Air, as upon the richeſt Land; in this Reſpect, rich and poor Land partake equally: And therefore that Increaſe from whence the Farmer muſt expect his Plenty, muſt be ſuppoſed to enter by the Roots, and not to be imbibed from the Air.

Tillage will do without Dung.

§ 11. And a ſufficient Plenty of this Proviſion for the Roots of Corn, may be obtained by continual Summer Tillage, upon moſt Sorts of Land, without the Help of Dung. This will not eaſily be believed by thoſe who have a Fondneſs for Dung; Truth muſt be very clearly proved, when oppoſed to the Prepoſſeſſions and Prejudices of Men: But how oppoſite ſoever it may be to the general Opinion, certain Experience will prove it true, that ſufficient Tillage will do the Buſineſs without Dung; and even poor Land, with continual Summer Tillage, will produce good Crops, without Dung; tho' it muſt be acknowledged, that the End is to be obtained more ſpeedily by the Aſſiſtance of Dung: And it is poſſible there may be ſome Sorts of Soil, which may be diſſolved by the Help of Dung, that may not ſo eaſily be broken and divided by Tillage without Dung: But generally it is certain, that it may be effectually done by Tillage without Dung. There are many Farms ſo ſituated, that much of the poor Land belonging to them, is at a great Diſtance from the Yards or Places where they make their Dung, and the Charge of carrying it to ſuch Land would be more than the Value of the Dung when there; and therefore they lay all their Dung, where they think it will better and more immediately anſwer the Charge of Carriage; the Conſequence of which is, that ſuch poor Land, having no Dung for many Years, muſt frequently lay fallow; and it often happens, when the Summer Tillage is well performed upon ſuch Land as it ſhould be, that it will produce an extraordinary Crop, as good, nay ſometimes better than richer Land, which is often dunged.

§ 12. After good Summer Tillage, I have ſeen a great Crop of Wheat, I think as good as ever I ſaw, and that upon Land reputed to be worth not above five or ſix Shillings an Acre annual Rent; and that, where no Dung had been laid in the Memory of Man: When any Thing like this happens, it is generally look'd upon as the Effect of Chance, or an extraordinary kind Seaſon: But if nicely examined into, it would be found to be the Effect of better Tillage, than is uſually beſtowed upon ſuch Land. Thus by good Summer Tillage, ſome Farmers get better Crops from poor Land, of eight or ten Shillings an Acre Rent, than others, for want of ſuch Summer Ploughing, can get from Land of double that Rent. And ſome Farmers who live where it is not the Cuſtom to fallow their Land, will ſay that they don't know but that Summer Fallow might do their Land ſome Good, but their Land is too dear rented to let it lay fallow; which is as much as to ſay, that becauſe their Land is dear rented, therefore they can't afford to make the beſt Advantage and the moſt Profit of it; which ſeems to me to be a very prepoſterous Way of Reaſoning. And yet the Men who talk thus will buy Dung, if it be to be bought within the Reach of their Strength to fetch it, and as far as their Money or Credit will reach, they will beſtow it at the Rate of five Pounds an Acre upon their Land; but they think they ſhould be ruin'd, if they ſhould beſtow a Summer's Ploughing, which in Rent and Charges does not amount to near half the Money, and would do more Good, as I am very well aſſured by my own Experience.

§ 13.

Tillage may be had where Dung cannot.

§ 13. Tillage may be performed where Dung is not to be had; and ſufficient Tillage may be had at a much leſs Expence, than the Purchaſe of Dung: And Tillage will ſupply the Abſence of Dung, but Dung will not ſupply the Want of Tillage. If any one thinks otherwiſe, and has a Mind to be ſatisfied, he may eaſily try the Experiment: He may ſow Wheat Year after Year upon the ſame Land, and lay as much Dung as he pleaſes, or as much as he can get for his Money; and we in the Horſe-hoing way will ſow Wheat every Year on the ſame Land, and by the Help of our Summer Tillage we can have fifty or ſixty fold Increaſe of our Seed, without Dung; when he, notwithſtanding all his Dung, by the third or fourth Year ſhall not be able to get his Seed again.

Dung will do nothing without Tillage.

§ 14. The Sum of the whole Argument is this, that ſufficient Tillage will ſupply the Want of Dung; but all the Dung in the World will not produce Corn without Tillage. Tillage without Dung will produce a Crop of Wheat every Year, and that even upon poor Land; which all the Dung in the World will not do without Tillage. But it muſt be acknowledged, that Dung and Tillage together will do more than can be done by Tillage without Dung: For tho' by ſufficient Tillage poor Land may be brought to produce good Crops without Dung, yet by Dung and Tillage together much greater Improvements may be made on ſuch poor Land; but without Tillage, Dung will do nothing at all.

CHAP. IV. *Of different Sorts of Land.*

Various Opinions of what Sort of Land is moſt proper for the Hoe-Plough.

§ 1. As ſome Perſons are of Opinion, that theſe Improvements in the Horſe-hoing way of Husbandry may have ſome good Effect upon ſome Sort of Land, but not on other Sorts (tho' I don't find that they can agree about what Sort of Land will ſucceed beſt; for ſome ſay it may do upon rich Land, but not upon poor; and others ſay, that it may do upon poor Land, but can be of no Advantage upon rich) therefore it may not be amiſs to make ſome Inquiry about the different Sorts of Land.

In what Reſpect Land may be ſaid to be of different Sorts.

§ 2. Land may be ſaid to be of different Sorts, in theſe ſeveral Reſpects.

Firſt, As to the different Degrees of Heat and Moiſture.

Secondly, As to the Depth of the upper Surface proper to be wrought with the Plough or Spade.

Thirdly, As to the Quantity of real Earth contained in that Depth.

And, *Firſt*, Concerning the different Degrees of Heat and Moiſture; as I ſhall ſpeak more particularly of this hereafter, it will not be neceſſary to ſay much about it here.

Secondly, Concerning the Depth of the upper Surface; of this I ſhall be more particular, when I come to explain more fully the Manner of performing the Summer Tillage with the Hoe-plough. So that what I ſhall particularly take notice of here, with reſpect to the different Sorts of Land, is what is uſually called the Difference of the Soil, which I diſtinguiſh by, *Thirdly*, The Quantity of real Earth, contained in the upper Surface, that is wrought with the Plough or Spade.

What is meant by pure Earth.

§ 3. To explain what is here meant by real Earth, it muſt be conſidered that the different Sorts of Soil, which are diſtinguiſhed by the different Names of Gravel, Sand, Chalk, Loam, Clay, *&c.* differ in regard to the very Matter or Subſtance of which ſuch Soils are compoſed. For Example, Gravel is a Mixture of Stones, of various Sizes, with ſome Sand and Loam, and a Quantity more or leſs of *pure Earth*.

That which enters into the Roots of Plants.

§ 4. By *pure Earth*, I mean that Matter or Subſtance, which enters into the Roots of Plants, to increaſe their Growth, and conſequently that which is converted into the very Subſtance of Wheat, Barley, or any Kind of Corn or Fruit, or any other Vegetable whatſoever. Now a Stone, tho' no bigger than a Grain of Sand, cannot enter into the Root of a Plant, or any way nouriſh a Plant, ſo as to be converted into, or become a Part of the Subſtance of the Plant: And therefore Sand, if it had no Mixture of fine Earth among it, would be intirely barren; for every Grain of Sand being really a hard Stone, it could never enter into the Roots of any Plant: But as all Sand has ſome Mixture of fine Earth with it; ſo there is a very great Difference in the Richneſs and Fertility of thoſe Sorts of Soil, which are called Sandy; ſome having (it may be) nineteeen Parts in twenty of fine Earth, to one of Sand: Other Sorts of Sandy Land may have nineteen Parts of Sand, to one of Earth.

Land is richer or poorer, as it contains more or leſs real Earth.

§ 5. Now I think no Farmer can be ſo ignorant, but he may bring himſelf to underſtand the Difference between what may be properly called Earth (ſuch as may paſs into the Roots of Wheat or other Plants) and Stones, or other hard Subſtances which are mixed with the Earth upon his Land, but can never enter into the Roots of his Corn, or any way increaſe the Product of what he ſows or plants. Every Kind of Soil therefore is ſo far richer or poorer, in Proportion to the Quantity of fine Earth, which is prepared to enter into the Roots of Corn, or other Vegetables to be cultivated thereon.

Objection.

§ 6. Altho' this Book is more particularly intended for the Inſtruction of the practiſing Farmer, yet as it may be likely to fall in the way of ſome who are Men of Science, it may be proper to obviate an Objection which may be ſtarted againſt what I have here ſaid of the different Degrees of Richneſs and Poorneſs of Land. There are Perſons whoſe Heads are full of ſublime Ideas and philoſophical Speculations, not always leading to ſound and uſeful Knowledge, or experimental Truths: If any ſuch Philoſopher ſhould object, and ſay that what I call pure Earth, is really a Mixture of various Salts both fixed and volatile, Oil, Nitre, and Sulphur, and many unctuous, fattening, and other occult Qualities, and not a bare *Caput Mortuum*, as I ſeem to repreſent it.

Anſwer.

§ 7. Whoever ſhall be pleaſed to ſhew his Learning, and Skill in *Analytics*,* by making ſuch an Objection; I will not enter into a Diſpute, or contend with him about it: What I call pure Earth, he may call by any, or all *theſe* and as many more *fine Names* as he pleaſes; I ſhall only beg Leave to include *them all* in what I call fine Earth: It will ſtill be the ſame Thing in this Caſe; it is what the Plants take in for their Nouriſhment; it is what a Plant, by Corruption and Decay, will return to again; it is what we find in all Land more or leſs, and it is what Summer Tillage prepares on all Sorts of Land, in greater Quantity than where the Tillage is neglected, or but imperfectly performed.

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* *Analyſis* and *Analytic* are Words uſed to ſignify, the taking any Subject or Thing to pieces, and examining its Parts.

Of different Plants requiring different Nouriſhment.

§ 8. Concerning different Plants requiring different Sorts of Earth for their Nouriſhment: This and ſome other curious Inquiries of this Nature will be examined, and more fully conſidered hereafter. I ſhall here only make another Obſervation or two of the different Sorts of Land.

Of ſtiff Land.

§ 9. Some Sorts of Land are ſo ſtiff and hard, by the ſmall Parts thereof ſettling cloſe, and uniting for want of ſufficient Tillage, that the tender Roots of Corn can no more enter into the Clods or hard Lumps thereof, than they can enter into Pieces of Braſs or Marble; yet by ſufficient Tillage theſe Sorts of ſtiff Land may be made ſo fine and gentle, that the Roots of Corn will enter freely, get Plenty of Nouriſhment, and produce good Crops.

Of light Land.

§ 10. There are other Sorts of Land ſo light and hollow, that tho' the Roots can enter free enough, yet they are dried and ſtarved, for want of fine Particles of Earth to lay cloſe to the Roots, and nouriſh them: And by ſufficient Tillage theſe Sorts of light Soil may be ſo broken and divided, that the fine Parts will ſettle cloſe together, fill up the Hollowneſſes, keep in the Moiſture received from Rain or Dews, become a rich Nouriſhment to the Roots, and produce good Crops.

Both improved by Tillage.

§ 11. Thus ſtiff Land is made more gentle, and conſequently lighter, by continual Summer Tillage; and light Land, that is, Land which by Nature is too hollow and full of Pores, being ſufficiently broken and divided by continual Summer Tillage, its fine Parts, ſo broken and divided, will ſettle, and lay cloſer together, and ſo become more like to the ſtrong Land: And tho' ſome Men think and ſay, that light Land will be made lighter by much Tillage, nevertheleſs they ſpeak thus only for want of ſufficient Knowledge and Experience: let them try the Experiment upon a ſingle Acre of ſuch light Land, and ſee if they can poſſibly give it too much Tillage; they will certainly find that the more it is plough'd, the cloſer its fine Parts will ſettle, and the more Corn it will produce.

Two Objections.

§ 12. But here it muſt be acknowledged, that in the uſual way of ſowing Wheat at random all over the Ground, there are two very weighty Objections againſt making the Land too fine by Tillage.

Firſt, That it will be more apt to run to Weeds.

Secondly, The finer the Earth is made by Summer Tillage, the cloſer thoſe fine Parts will ſettle, and with the Winter Rains thoſe fine Parts will adhere and unite together, and the Ground will become more ſtale and hard by the next Spring, which will be a Hindrance to the Growth of the Wheat, its tender Roots not being able to enter into the Earth, and ſpread themſelves to find their Nouriſhment in ſuch hard Ground, as they will when the Earth is lighter and more gentle.

Both theſe Objections will be fully anſwer'd, and the Inconveniences removed, by ſowing or drilling the Wheat in Rows, and by the Practice of Horſe-hoing.

Firſt, That Summer Tillage increaſes Weeds.

§ 13. *Firſt*, As to the Weeds; where the Land is made very fine by the Summer Tillage of one Year's Fallow, and Wheat ſown early, it is apt to run to Weeds, and thoſe Weeds grow away ſo faſt and vigorouſly, that they over-power the Corn, and ſpoil the Crop: This is a great Diſcouragement to the Farmer, which makes him afraid of ploughing his Land too much; and yet this very vigorous Growth of the Weeds plainly proves that Summer Tillage enriches the Land, and makes it more fertile. And it is certainly true, that the more any Sort of Land is ploughed or hoe'd, the more vigorouſly the Weeds will grow; and if the Farmer has no other Way to humble the Weeds but by ſtarving his Land for want of Tillage, he is in a very bad Way. But this Objection may as properly be made againſt Dung as againſt Tillage, for Dung alſo very much increaſes the Growth of Weeds: And the Farmer may be well aſſured, that if he could bring his Land into ſuch a Condition that the Weeds would not grow in it, he would have but little Succeſs with his Corn. However, this Objection will be fully anſwer'd, when we come to ſhew the Method of performing the Horſe-hoing Tillage.

After much Tillage the Land ſettles and gets more ſtiff.

§ 14. *Secondly*, The other Objection is, that when the Land, eſpecially ſtrong Land, is made very fine by Tillage, thoſe fine Parts will ſettle ſo cloſe, and bind with the Winter Rains, and the Land will get ſo ſtale and hard by the Spring of the Year, that when the Wheat wants moſt Nouriſhment for the Summer's Growth, the Ground is got too hard for the tender Roots to penetrate: The Wheat is ſtarved, and but a poor Crop produced.

Both theſe Objections are anſwer'd, and the Inconveniences remedied by Horſe-hoing.

§ 15. Theſe are indeed great Objections againſt ſowing at random, but none againſt ſufficient Tillage: For to him that drills his Corn in Rows, at proper Diſtances, theſe will be no Objections at all. The Weeds he can deſtroy without Damage to his Corn; and the Staleneſs or Hardneſs of the Ground will be remedied by the continual Tillage which is performed while the Corn is growing.

And now having thus far cleared my Way, and I hope ſufficiently proved my firſt Point, that Summer Tillage is a great Improvement to all Sorts of Land, I ſhall proceed to ſhew how Wheat and other Grain may be ſowed or drilled in Rows, ſo as to admit of continual Summer Tillage while the Crop is growing.

This ſhall be the Subject of the next Book.

BOOK II.

CHAP. I. *Of drilling Corn in Rows for Horſe-hoing.*

Of narrow Ridges.

§ 1. THE Method which by many Years Practice and Experience has been found to be the moſt ſucceſsful, is to lay up the Land in narrow round Ridges, of four Feet and an half, or five Feet wide, according to the different Goodneſs or Richneſs of the Land, and ſow two Rows of Corn on the Middle or Back of every Ridge: This Work is performed with great Exactneſs by an Inſtrument which we call a Drill-plough, (which ſhall be particularly deſcribed hereafter.) The Space between theſe two Rows is ten Inches, which we call the *Partition*; and the Space between theſe and the next double Row we call the *Interval.*

The *Partition* and *Interval.*

§ 2. The Reader is therefore deſired to obſerve, that by the Word *Partition* is always meant the narrow Space between the two Rows of Corn, on the Middle of every Ridge; and the Word *Interval* is always to ſignify the wider Space between thoſe two Rows and the next double Row upon the Middle of the next Ridge: So that if the Ridge be four Feet and an half broad, and the Partition ten Inches, then the Interval will be three Feet and eight Inches; and if the Ridge be five Feet, the Interval will be four Feet and two Inches. The Partition is to be kept clean by Hand-hoing, and the Interval is to be kept in Tillage with the Hoe-plough, in the Manner that will hereafter be deſcribed. If the Interval be leſs than three Feet and an half, there will not be Room for two Furrows; and they that make the Partition wider than ten Inches, only make the Interval leſs, by which they increaſe the Charge of Hand-hoing, and gain no Advantage.

Double Rows the beſt Method.

§ 3. Mr. *Tull*, who appears to be the firſt Inventor of this Practice, tried ſeveral Methods before he fixed upon this which is here recommended, and which by ſeveral Years Experience he found to be the beſt. He tried different Numbers of Rows, three, four, and five Rows, with Partitions and Intervals of different Breadths; but by Experience he found, that many Rows only hindered and ſtarved one another: Even in triple Rows, the middle Row robbed and impoveriſhed the two outſide Rows, and the Outſide ſtarved the Middle; and he always had the beſt Succeſs from double Rows, with ſuch Partitions and Intervals as are here recommended.

§ 4. And tho' from what has been ſaid upon Tillage, it may be thought that ſingle Rows at proper Diſtances would be the beſt Practice, that every Plant might have the Benefit of Tillage on each Side of it; and ſo it might be, if the Tillage could be performed to a ſufficient Depth, in an Interval of twenty Inches, or two Feet: But beſides that a greater Number of Intervals would but increaſe the Expence, the Work of the Hoe-plough cannot be well performed in an Interval that is leſs than three Feet and an half: And ſuch an Interval being ſufficient to maintain and nouriſh the Roots of two Rows, therefore double Rows will produce a better Crop than ſingle Rows; and it is found by Experience, that if one Side of a Plant, or of a Row of Plants, has the continual Help of Tillage, they will put out ſuch a Quantity of their Roots that Way, as will preſerve the Plants in Health and Vigour, as well as if they had the Help of the Tillage on both Sides, or all round every Plant. And therefore, this being found by Experience to be the beſt Method, it is here recommended as ſuch.

To the well-managing of Land in this Way, two Inſtruments (not uſual in the common Practice) are very neceſſary, which are the Drill-plough to ſow the Corn, and the Hoe-plough to perform the Tillage while the Corn is growing. Both theſe Inſtruments ſhall be perfectly deſcribed hereafter: And thoſe who care not to be at the Trouble of having them made from thoſe Deſcriptions, ſhall be informed where they may have them made at reaſonable Prices.

The Drill-plough diſtributes the Seed exactly in Quantity, and to an equal Depth.

§ 5. Firſt the Drill-plough. This ſtrikes the Furrows, ſows the Seed, and harrows it in at the ſame Time; and it is ſo contrived, with Screws to regulate and ſet it, that we can ſow any Quantity of Seed to an Acre, and that with the greateſt Exactneſs. And another Advantage of theſe Drill-ploughs is, that they lay all the Seed to an exact and equal Depth in the Furrows; whereas, in the common Way of ſowing Wheat, the Harrows bury a good Part of the Seed too deep, and ſome they ſcratch up to the Top of the Ground. But ſowing to an exact and equal Depth is a Point of ſome Conſequence, becauſe all that is buried too deep, as well as that which is ſcratched up to the Top of the Ground, is utterly loſt and thrown away. And for this Reaſon, amongſt others, they are obliged to ſow an unneceſſary Quantity of Seed.

It makes a narrow Furrow.

§ 6. A further Advantage of the Drill-plough is, that it makes a very narrow and even Furrow, not above an Inch broad, by which means the fewer Weeds have a Chance to come up in the very Line with the Wheat: But this, though of great Advantage in keeping the Land clear of Weeds, and though the Deſtruction of Weeds be a Point of ſo great Conſequence, yet it is but little conſidered by ſuperficial Obſervers. And therefore,

§ 7.

Some think this a Diſadvantage, not conſidering how the Roots ſpread into the Intervals.

§ 7. Some Farmers think this a Diſadvantage: They imagine that the wider the Wheat ſpreads in the Furrow, even to three or four Inches, it is (as they call it) croping ſo much more of the Ground, not conſidering that the Roots are not confined to the Narrowneſs of the Row, or Breadth of Ground which the Plants ſtand upon, but will ſpread into the Intervals, even to a conſiderable Diſtance: But this is what is very little known or thought of among Farmers, and very few of them will believe it when they are told by thoſe who do know it, that the Roots of a ſingle Row of Wheat will ſpread above a Foot and an half, or near two Feet into the Interval, if the Ground be made fine and gentle by Tillage, and kept clean from Weeds: Nevertheleſs, whether they will believe it or not, it is certainly true. Their not knowing and conſidering this, is the chief Cauſe of that unreaſonable Prejudice which moſt Farmers have conceived againſt theſe Methods of Tillage we are now treating of, before they at all underſtand it, or have had it explained to them. The great Objection, to which they think there can be no Anſwer, is contained in this Queſtion: *If* (ſay they) *you ſow but half the Land, how can you have more than half a Crop?* This being an Objection upon which they lay great Weight, and preſs upon it with all their Force, it may be proper to examine it, and give it a particular Anſwer.

CHAP. II. *Of ſowing all, or but half the Land.*

What is meant by ſowing all the Land.

§ 1. If the Men who aſk this Queſtion would only be pleaſed to conſider what they really mean, when they talk of ſowing all, or but half the Land, they would ſurely find that they have no ſteady and certain Meaning in theſe Words, though they ſo readily and frequently make uſe of them.

The Plants muſt have Room to grow.

§ 2. For if by ſowing all the Land, they mean to ſow the Seed ſo thick, that the Plants may touch one another when they firſt come up, this is what no Body ever does; and if they did, there would be no Room for the future Growth of ſuch Plants. Therefore when they talk of ſowing the Land all over, if they would be underſtood to mean it in a rational Senſe, they muſt mean to raiſe Plants at ſuch reaſonable Diſtances, that when they come to their full Growth they may cover the Ground, and touch one another all over the Land. But to do this, they muſt allow ſuch Plants Room, in proportion to their Bigneſs, when they ſhall be at their full Growth. If then they will ſay, that they mean to ſow in ſuch a Manner that the Ground may be well covered, I would aſk them *When* it is that they would have the Ground covered? Not when the Seed firſt comes up: —No Land was ever ſowed ſo thick.—What then, ſhould the Ground be covered when the Plants are at full Growth, or at half Growth, or when? If they ſay they would have the Ground covered when the Plants are but at half their Growth, then I anſwer, there will be no Room for them to come to full Growth. If they ſay they would have the Land well covered when the Plants ſhall be at full Growth, then I agree with them; but then I ſay they muſt allow ſuch Plants Room, in proportion to their Bigneſs when full grown.

Few Men have ſeen a ſingle Plant of Wheat grown to any Perfection.

§ 3. That which occaſions the Difficulty and Puzzle in this Way of Talking, is, that Farmers have ſeldom obſerved what a fine, large, and flouriſhing Plant will proceed from a ſingle Grain of Wheat. They have hardly ever taken notice of the Growth that a ſingle Plant of Wheat will make, when it has ſufficient Nouriſhment, and Room to ſpread: And therefore they are not competent Judges of the Diſtance that Rows of Wheat-Plants ſhould be allowed, that they may have Room to attain their full Perfection of Growth. Whoſoever takes any notice of the Practice of Gardeners, may have ſome Apprehenſion of this: They that only walk into a Garden, may have ſome Notion what Sort of a Plant an Apple-tree, a Gooſeberry-buſh, a Cabbage, or a Lettuce will be, when at full Growth, becauſe in a Garden they may ſee ſuch Plants ſtanding where they have Room to perfect their Growth: But the Farmer does not, in the Courſe of many Years Experience, ſee a ſingle Plant of Wheat that ſtands where it can grow to any Perfection.

Gardeners allow their Plants Room to grow.

§ 4. The ſkilful Gardener knows very well that all Plants require Room for their Roots, in proportion to the Bigneſs of ſuch Plants when full grown: He knows that there is a remarkable Difference between the Bigneſs of Cabbages and Lettuces: Lettuces will attain their full Growth pretty well, when planted in Lines or Squares, at the Diſtance of ten or twelve Inches; but Cabbages,

bages, if the Gardener would have them grow to be what they call fine large Cabbages, he muſt allow them Room, at leaſt three Feet Diſtance one from another; and if he plants them nearer, he conſtantly finds they will not grow ſo large. And when any of theſe ſort of Plants are cultivated by the Ignorant and Unſkillfull, who are greedy of having many Plants grow in a ſmall Compaſs, they are all ſtarved, and not one in an hundred comes to any Perfection. Plant or ſow what you will, from the largeſt Tree to the ſmalleſt Herb, if you would have your Plants thrive, you muſt ſet them at proper Diſtances, and allow them Room to come to their full Growth; you muſt alſo keep them clean from Weeds, and beſtow ſome Tillage upon the Land while the Plants are growing.

§ 5. Land is then managed to the greateſt Profit and Advantage, when the Plants cultivated therein are brought to the greateſt Perfection.

Land is then beſt managed when Plants are brought to the greateſt Perfection.

§ 6. But when the Farmer ſows three Buſhels of Seed-Wheat upon an Acre of Land, if he gets thirty Buſhels for his Crop, which is but an Increaſe of ten fold, he accounts it no bad Crop: It cannot then be ſaid that he brings his Plants to any great Perfection.

But Wheat at ten or twelve fold Increaſe is not brought to Perfection.

§ 7. For we certainly know by Experience, that a ſingle Grain of Wheat, well cultivated, will produce fifteen or twenty Ears, and thoſe Ears one with another will contain forty or fifty Grains, which is ſeveral hundred fold Increaſe. And it is a certain Truth, well known to thoſe who have tried theſe Experiments, that ſingle

The natural Increaſe of Wheat is ſeveral hundred fold.

gle Grains of Wheat, being planted ſingle in Rows, not one Grain in ten will fail to grow, and they will one with another produce from ſix, eight, to ten, twelve, and even to twenty Ears, and upwards: And thoſe Ears will contain fifty or ſixty Grains one with another, and ſome an hundred.* If then of three Buſhels which the Farmer ſows, only half of it did grow, and every Plant produced but one Ear of fifty Grains, one with another, the Produce would be ſeventy-five Buſhels, or nine Quarters and an half *per* Acre; which would be three times the Crop that Farmers uſually obtain. What is the Reaſon of this? Aſk the Farmers:—Not one in fifty will give you a rational Anſwer.

The Plants ſtanding too cloſe, ſtarve one another.

§ 8. And yet the Reaſon is very plain and eaſy, and it is only this, that the Plants ſtanding ſo cloſe and thick upon the Ground, they impoveriſh and ſtarve one another; and although every Plant would produce ſeveral Ears, if they had fair Play for their Lives, that is, if their Roots had Room to get ſufficient Nouriſhment, by ſtanding at proper Diſtances; yet as they ſtand ſo thick and cloſe, they are all ſtarved to ſuch a Degree, that they cannot one with another bring one Ear, no nor half an Ear to Perfection. The experienced Gardener well knowing this, provides the proper Remedy, and among all the various Sorts of Plants he cultivates, he takes care to allow them Room in proportion to their Bulk. The larger Kinds he tranſplants from his Nurſeries to proper Diſtances; his Apple and

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* It was objected to me laſt Year, that theſe Experiments would not ſucceed in the Field as they did in the Garden; but upon Trial I find the ſame Succeſs in the Field this Year, as I had in the Garden laſt Year.

Pear Trees to twenty or thirty Feet; his Gooſeberries to five or ſix Feet; his Cabbages to three Feet; his Lettuces, Onions, Carrots, *&c.* he hoes, and ſets them out to ten or twelve Inches, and ſo all in proportion to their ſeveral Bigneſſes: And whenever, through unſkilful Greedineſs, theſe Plants are crowded too cloſe together, they are ſtarved, and the Crop proportionably diminiſhed, and ſpoiled like the Farmer's Wheat.

Land is ſowed all over in a rational Senſe, if the Plants at full Growth cover the Ground.

§ 9. When Farmers therefore talk of ſowing the Land all over in their Way, and not cropping half the Land in our Way, let them conſider a little what they mean. A Farmer may think it ſtrange, and perhaps take it ill, to be told that he don't know what he means when he talks of ſowing Corn; but I would deſire him not to be angry, but to examine and conſider the Caſe a little patiently.——Three Buſhels of Wheat, which is the uſual Quantity that is ſowed upon an Acre of Land, is about forty or fifty Grains to every Foot ſquare, but 4000 Grains of Wheat may lay upon a Foot ſquare of Ground, and not all touch one another; ſo that ſome hundred Buſhels might be ſown upon an Acre, and the Land but juſt crop'd all over, in the ſtrict and literal Senſe of the Words, and the Plants ſcarce touch one another when they firſt come up. Therefore, when Men talk of ſowing the Land all over, they ſhould be underſtood to mean it in a rational Senſe, and then the Land may be rationally ſaid to be crop'd all over, when the Rows are at ſuch Diſtances as will bring the Plants to their greateſt Perfection of Growth, and that when the Plants are come to their full Growth, the Ground may be well covered with them. Cabbage Plants at three Feet aſunder ſeem at a great Diſtance, when the Plants are young and ſmall, but when they come to their full Growth, their outſide Leaves will touch and crowd one another; and the Ground may then be properly ſaid to be planted all over with Cabbages: But to crowd any Plants too cloſe together while they are young and ſmall, is not the Way to have them come to any Perfection of Growth, but to ſtarve them all, as has been obſerved; and this is the Caſe of the Farmer's Wheat in general: For the uſual Increaſe that Farmers make of their Wheat ſeldom or never amounts to twenty fold, whereas the natural Increaſe is ſeveral hundred fold. I hope I ſhall be excuſed for ſaying ſo much, to ſhew the Abſurdity of this Way of Talking, about ſowing all the Land, becauſe this Point has been urged with ſo much Vehemence, by ſome Perſons, whoſe Underſtandings one might think ſhould inform them better. And now, having I hope ſufficiently anſwered this captious Queſtion, viz. *How can you have above half a Crop, if you ſow but half the Land*; I ſhall proceed to the Management of our double Rows of Wheat.

CHAP. III. *Of preparing the double Rows for Horſe-hoing.*

Early Sowing recommended.

§ 1. The beſt Time for ſowing the Wheat is before *Michaelmas*; and in this Way of Culture, it cannot be ſown too early after Harveſt, as I have ſeen by the two laſt Years Experience. I have Wheat now growing; ſome ſown three Weeks before *Michaelmas*, ſome a Fortnight, and ſome the Week before, and ſome the Week after *Michaelmas*: The firſt is much the beſt, and ſo in proportion to the laſt, which in all Appearance is likely to ſucceed the worſt. In the common Practice of Huſbandry, where they ſow at random, there are two Inconveniences which diſcourage the Farmer from ſowing his Wheat ſo early, eſpecially upon ſtrong rich Land; and they are the ſame as have been mentioned before, concerning making the Land too fine by Summer Tillage: The one is, that the Weeds will come ſo thick, as to damage his Crop conſiderably: The other is, that the Land will have the longer Time to ſettle, and get ſtale and hard by the Spring. Both theſe Inconveniences are removed by the Horſe-hoing Practice; for the Weeds in this Way are eaſily deſtroyed; and the Staleneſs of the Land is remedied by the Tillage of the Hoe-plough. But as this continual Summer Tillage nouriſhes and improves the Plants all the while they are growing, ſo it makes them longer lived, and conſequently ſowing early is a great Advantage; for Wheat ſown late, and managed in this Way, will be lean, for want of Time in our ſhort Summers to bring it to its full Perfection.

The Hoe-Plough.

I ſhall now proceed to deſcribe the Manner of performing the Tillage with the Hoe-Plough while the Wheat is growing. This Inſtrument, which we call a Hoe-Plough, is different from a common Plough chiefly in this Reſpect, that it does not follow the Horſes Path in a direct Line, as the common Plough generally does, but it is to be ſet and altered different ways, as the Work requires; and it follows always in a Line that is parallel to the Horſes Path, but either to the Right or Left, at more or leſs Diſtance, as Occaſion requires. Thus when the Path for the Horſes to go in is the Middle of the Interval, the Hoe-Plough can turn a Furrow a Furrow from the Row of Corn, and cut it off from within an Inch or two of the very Plants. And ſo when the Horſes go on one Side of the Interval, it can turn a Furrow *to* or *from* the Corn on either Side of that Interval, that is, *to* the Corn on the Right-hand, or *from* the Corn on the Left-hand; for the Hoe-Plough always turns the Earth the ſame Way, that is, to the Right-hand: And as it is ſometimes neceſſary for the Horſes to go on one Side of the Interval, when the Furrow is to be ploughed on the other Side, therefore this Work cannot be performed by the common Ploughs; in other Reſpects the Hoe-Plough is but little different from other Ploughs. This Inſtrument will be particularly deſcribed, with Directions how to make it, and for its ſeveral Uſes, with Copper-plates ſhewing the whole and its ſeveral Parts. There will alſo be the like Deſcriptions of the Drill-Plough for Wheat and other Corn, and the Turnip-Drill, which will alſo ſow ſeveral other Sorts of ſmall Seeds.

The firſt Hoe-Ploughing.

§ 3. The firſt Work that is to be done with the Hoe-Plough is ſoon after the Wheat is come up, or about the latter End of *October* or Beginning of *November*, when other Men are ſowing Wheat; and that is, to open a Furrow from the double Row on each Side, turning the Earth into the Middle of the Interval: This Work leaves the Wheat ſtanding on the Ridge, with an open Furrow like a Sort of Ditch or Trench on each Side of it, which effectually keeps it dry all the Winter, and very much preſerves it from the Injuries of Wet and Froſt during the Rigour of that Seaſon. In doing this, there is no Danger of ploughing too near the Wheat, for at this firſt Hoe-ploughing before Winter, we cannot go too near, if Care be taken not to plough it out of the Ground; the nearer we go to it, the more effectually we let out the young and tender Roots into the freſh plough'd Earth; whereas if we do not go within three or four Inches of the Plants, the Earth which is left unploughed (eſpecially in ſtiff Land) will be as a Wall, to keep the Roots from the Benefit of the Tillage in the Interval; and I have ſeen by theſe two Years Experience, that where the Hoe-Plough goes neareſt, there the Wheat thrives the beſt.

The ſecond Hoe-Ploughing.

§ 4. When this firſt Hoe-ploughing is done, there is no Occaſion to do any more to it, till the latter End of *February* or Beginning of *March*, and then we turn the Furrows from the Middle of the Interval to the Wheat again. The proper Time to do this will be a little ſooner or later, with regard to the Forwardneſs or Backwardneſs of the Spring: A little Obſervation when the Weeds begin to come, will be a better Direction than all that can be ſaid upon it.

Hand-hoing and Weeding the Partitions.

§ 5. The next Work to be done is Hand-hoing and Weeding the Partitions. This Work will be more Trouble and Charge the firſt and ſecond Years than ever it can be afterward, eſpecially the firſt Year; for as the Hoe-ploughing the Intervals improves the Land, ſo it conſequently makes the Weeds grow more vigorouſly than ever they were uſed to do on the ſame Land before. All the Seeds of various Sorts which lie near the Surface will feel the Influence of this Tillage, and ſpring up abundantly; and all thoſe Sorts which grow from old Roots will be exceeding troubleſome and difficult to manage the firſt Year. As for thoſe Weeds which come from Seed, if they are not neglected too long, but taken in Time, they may be pretty eaſily dealt with: But thoſe other Sorts, which grow from the Fragments of old Roots, will not be ſo eaſily killed the firſt Year, but muſt be cut down again and again; they are a Sort of Enemies that require more than once killing, or, which is much the ſame, Men find them alive after they thought they had killed them.

Weeding, if well done the firſt Year, will be but little Trouble afterwards.

§ 6. But we have Encouragement enough to labour at their Deſtruction, for if they are well kept under the firſt Summer, they will be much leſs Trouble the ſecond, as I have found by the laſt two Years Experience. And if this Work be not neglected, all theſe pernicious Enemies will be ſo utterly deſtroy'd in three or four Years, that the Buſineſs of Weeding will be a very Trifle. And let any one conſider, what Crops of Corn may be produced by ſome rich Lands, when the Weeds are deſtroy'd, which in the preſent way of Work rob the Corn of ſo great a Part of its Nouriſhment. If we look into Wheat and Barley Stubbles at Harveſt, when the Corn is juſt cut, eſpecially upon what is called good Land, we ſhall have great Reaſon to believe, that the Weeds generally come in for near half, and ſometimes much more than half of the Richneſs and Fertility of the Earth.

The third Horſe-hoing.

§ 7. This Hand-hoing and Weeding being well done for the firſt time, then by the latter End of *April* or Beginning of *May*, the next, which is the third Horſe-hoing, is to be performed, Regard being had to the Coming of Weeds in the Intervals, which may make it neceſſary to be done ſooner by a Week or ten Days. This Work is near the ſame as the firſt, which was directed to be done before Winter; that is, to turn the Furrow from the

Wheat; only it is not neceſſary now to plow quite ſo near to the Rows, as at the firſt ploughing; though we need not be afraid of opening the Furrows within three or four Inches of the Row of Plants: For,

Cutting the Roots does no Injury to the Wheat.

§ 8. It is a wrong Notion which ſome People have got, that this Hoe-ploughing in Summer muſt do an Injury to the Corn, by cutting many of its Roots, which they think muſt weaken, and almoſt kill the Plants: Whereas the contrary is proved both by Reaſon and Experience; for though a great Number of Roots are cut off at every Summer ploughing, yet theſe are but an inconſiderable Number in proportion to thoſe which are left unhurt, and which are fully ſufficient to maintain the Plants, till Nature ſupplies them with freſh Roots, which in a very few Days they will put out in abundance, more by many fold than thoſe that were cut off. And this, whoſoever will be curious enough to obſerve, may ſoon be convinced of; for we find that the Corn does always thrive and grow away apparently after every Summer Ploughing.

The fourth Horſe-hoing.

§ 9. The next Horſe-hoing, which is the fourth, is the ſame with the ſecond, which is to turn the Earth on each Side to the Wheat again: And this, if the Land be in pretty good Condition, may be the laſt Work till Harveſt; and the Time for performing it is in *June*, ſoon after the Wheat has done bloſſoming.

§ 10. But

If the Land be not in good Tillage before, two additional Hoe-ploughings will be of great Service.

§ 10. But if the Land was foul with Weeds, and in a bad Condition of Tillage before it was put into the Horſe-hoing Way, it would then be adviſeable to give it two additional Hoe-ploughings the firſt Year: And then (the *firſt* being done in *October*) the Time for performing the *ſecond* ſhould be (if the Weather will permit) in *February*, or the firſt Week in *March* at fartheſt; then the *third* may be early in *April*; the *fourth* the Beginning of *May*; the *fifth* the Middle of *June*; the *ſixth* and laſt ſome Time before Harveſt. If we perform more than *four* Hoe-ploughings, I would recommend *ſix*; for it is moſt convenient that the Furrows ſhould be turned to the Corn, at the laſt Hoe-ploughing before Harveſt; becauſe it leaves the Land in the moſt proper Way for the Furrows to be turned back into the Middle of the Intervals, to make new Ridges for ſowing Wheat again ſoon after Harveſt.

Of preparing Ridges for ſowing Wheat again.

§ 11. This Work of preparing the Ridges for ſowing with Wheat again, may be done as ſoon as ever Harveſt is over, let the Weather be ever ſo dry; or if it ſhould come wet, it will be no Hindrance: We can plough it dry, and ſow it wet. The Land, after one Year's Hoe-ploughing, is in ſuch a Degree of Tillage, that no Weather can put us to any great Inconvenience. We can ſow our Wheat three Weeks before *Michaelmas*, and give it the firſt Hoe-ploughing before the Wheat Seaſon is over among the neighbouring Huſbandmen. And the Advantages of ſowing thus early, I have already taken notice of.

I ſhall now only add a few Words about the Reaſonableneſs and Certainty of a Crop, from

Land cultiuated in this Way; and this will prove my third Propoſition: That a much leſs Proportion of Seed Corn than is uſually ſown, would be ſufficient to produce better Crops than what Farmers generally obtain from their beſt Land. And conſequently, that Land may be kept in an improving Condition; as good, and better, or more profitable Crops produced; and that at much leſs Expence, than in the common Practice of Huſbandry.

Note, Hand-hoing and Weeding the Partitions muſt be repeated in Summer as Occaſion requires, for which it would be needleſs to give any further Directions.

BOOK III.

CHAP. I. *Of the Reaſonableneſs and Certainty of a Crop from leſs Seed Corn than is uſually ſown.*

§ 1. FArmers (as has been ſaid) uſually ſow three Buſhels of Seed Wheat upon an Acre, and if they obtain thirty Buſhels or four Quarters, which is but a ten or twelve fold Increaſe, they think it no bad Crop; though the natural Increaſe, as has been before obſerved, is ſeveral hundred fold.

The common Increaſe that is made of Wheat is ten or twelve fold.

§ 2. Three Buſhels of Seed Wheat to an Acre, is, upon a Medium, near fifty Grains to every ſquare Foot of Land, or between four and five hundred to a ſquare Yard. (But the

Their Plants come very unequally.

Leanneſs or Fullneſs of the Grain may make a conſiderable Difference, though this is not what is much taken notice of.) Now in their Manner of ſowing at random, and harrowing to cover the Seed, ſome is buried too deep, and ſome is ſcratched to the Top of the Ground; ſome falls in Heaps, and let the beſt Seed-man do his beſt, it will fall thicker in ſome Places, and thinner in others; and the Harrows will drag it about very unequally: So that when it firſt comes up, one may find upon one ſquare Yard five or ſix hundred Plants, upon another not above two hundred, and on ſome not near ſo many.

It is not much that is killed by the Winter.

§ 3. Whoever has the Curioſity to examine a Piece of common ſown Wheat, may count the Plants that grow upon a ſquare Yard, or any exact Meaſure of Ground: The Time to do this is when the Wheat is fairly come up, and before the Severity of the Winter. Then count them again upon the ſame Meaſure of Ground, in Spring, in *April*, and they will find, that not near ſo many Plants have been killed by the Winter, as is generally ſuppoſed. But what becomes of them from that Time till Harveſt? This is a Queſtion worth conſidering; for ſure all the Plants that are alive in *April* and *May*, ſhould reaſonably be expected to produce a fifty or ſixty fold Increaſe; for as ſome of theſe Plants will bring three or four Ears, ſo there is no good Reaſon can be given why every Plant that is alive ſhould not produce one Ear at leaſt, and therefore a fifty or ſixty fold Increaſe might reaſonably he expected. But when Harveſt comes you find nothing like it, no, not a twenty fold Increaſe. What is the Reaſon of this? Very few ſeem to know any thing of the Matter. I have planted forty ſingle Grains of Wheat in a

Row; nine and thirty of them came up, and thirty-ſeven of them lived out the Winter, and produced one with another above ten good Ears of Wheat, with upwards of ſixty Grains in an Ear one with another. And by ſeveral Trials of this Kind, I find that not one Grain in twenty fails to grow, and ſcarce one in ten but outlives the Winter.

Two Buſhels of the Seed live till Summer.

§ 4. If any body would take the trouble to examine and ſeek after it, he would find, that of ſown Wheat in general, there is as much of it alive upon the Ground in *April* and *May*, as bears a Proportion to two Buſhels of the Seed *per* Acre. (I ſay it is generally thus; indeed in ſome particular Caſes, or in ſome particular Years, it may be otherwiſe.) If then, of three Buſhels which are ſown, we ſuppoſe only two Buſhels to live and grow, and allow one Buſhel to be loſt by Accidents, if theſe two Buſhels remaining alive would produce only one good Ear for every Plant, which Ears ſhould have one with another fifty Grains, the Crop would be an hundred Buſhels. And yet this is no ſuch extravagant Suppoſition, when we know that a Plant of Wheat, which has fair play for its Life, will produce many Ears, and moſt of thoſe Ears will contain ſixty or ſeventy, ſome eighty Grains, and upwards: This I know and can affirm to be true, having proved it by my own Experience. I have ſeen many ſingle Plants of Wheat that have produced ten, twenty, ſome thirty Ears and upwards, and I have found thoſe Ears one with another to contain ſixty and ſeventy Grains of Wheat, and upwards.

§ 5. I ſay

Why ſhould it not produce a fifty-fold Increaſe.

§ 5. I ſay then, that if two Buſhels of the three ſown on an Acre, do live and grow, why ſhould it not produce a fifty-fold Increaſe? This would be a hundred Buſhels: Above twelve Quarters. But to talk after this Manner would make the Farmers ſtare. Aſk them what becomes of all their Seed Wheat? And obſerve what they have to ſay upon it, and what inconſiſtent Anſwers they will make: They will tell you, that ſome is loſt this Way, and ſome is loſt that Way, and ſome Plants won't produce an Ear; and in ſhort you will find, that the Queſtion is too hard for them. And it evidently appears, that from all that great Quantity of Seed they ſow, they have no reaſonable Certainty of a good Crop.

If the Land be rich, the Wheat falls.

§ 6. Upon Land that is rich and well dunged, if the Winter be mild, and a growing Spring, the Wheat will all be laid flat, the Weeds will grow through it, and [this in ſome Parts is called being *lodged*, in other Parts they have other Terms for it, but call it what they will] the Crop will be very much damaged.

If the Land be poor, the Wheat will be ſtarved.

§ 7. On the other hand, if the Land be not rich, then if the Winter be ſevere, and a backward Spring, or a dry Summer, the Wheat is all ſtarved: So that in general, the Increaſe that Farmers make of their Wheat is from eight to ten or twelve fold, which is called a good Crop; and twenty fold is an Increaſe never known in our Days.

We expect fifty fold Increaſe.

§ 8. In the Horſe-hoing Way we ſow but one Buſhel of Wheat upon an Acre; and if the Land be in a pretty good Degree of Tillage, then three

Pecks is ſufficient; if the Land be very clear of Weeds, and in fine Tillage, half a Buſhel will be enough. And we have a more rational Certainty of fifty or ſixty fold Increaſe, than he that ſows three Buſhels has of ten or twelve fold. For every Plant that lives will produce at leaſt one good Ear of Wheat at Harveſt, and ſomething more one with another. But an extraordinary Increaſe is not to be expected the firſt Year, for tho' the Land will be improved by the firſt Year's Summer Tillage, yet the Tillage muſt be performed, and the Weeds in ſome meaſure ſubdued, before we can expect to reap the Benefit of it.

This ſeems to have been better underſtood formerly than it is now.

§ 9. I do verily believe, that in ſome former Times the natural Increaſe of Corn has been better known and underſtood, and the Practice of Huſkandry better managed, than it is generally at preſent; and particularly as to this Point of the Quantity of Seed proper to be ſowed. I do not find any exact Quantity of Seed Corn, for any certain Meaſure of Land, mentioned any where among the Ancients who have written upon Agriculture: But we find ſome Hints of ſixty and an hundred fold Increaſe; particularly in the Goſpel, which I think muſt be as good or better Authority, than any other Writings of Antiquity; and there, in *Matthew* xiii. 8. and *Mark* iv. 8. and *Luke* viii. 8. we find *thirty*, *ſixty*, and *an hundred fold Increaſe*, expreſsly affirmed. I do not pretend, that our bleſſed Saviour, in this Parable, had any View to the Teaching of Agriculture, or any Deſign towards the Improvement of Land; but this I think may be certainly relied on, that ſixty and an hundred fold was the Increaſe that was made of Seed Corn in thoſe Times upon good Ground, and that thirty fold muſt then have been reckoned but a moderate Crop: For we can not ſuppoſe that our Saviour would have mention'd thirty, ſixty, and an hundred fold, if the uſual Increaſe had been then, as it is now, not above ten or twelve fold. The *Jews* would have been more prejudiced againſt his Doctrine than they were, if he had told them, tho' but by way of Parable, a Thing ſo contrary to the known Experience of the Times; and talked of thirty, ſixty, and an hundred, when they could have told him, that the greateſt Increaſe ever known never came up to twenty fold. From hence I would infer, and I think it but reaſonable to believe, that Men have in ſome former Times had a better Notion of the natural Increaſe of Corn, than Huſbandmen generally have in theſe preſent Times. The Practice of ſowing ſuch an over Proportion of Seed, I am apt to imagine, muſt have come by Degrees from the unſkilfull Greedineſs of ignorant Men, who thought if a little would do a little Good, ſtill more might do more Good. This is generally the Caſe of Countrymen, who are unſkilfull in the Practice of Gardening; if they ſow Onions, Carrots, Lettuces, or any ſuch Sort of Garden-ſeeds, they generally ſo overſtock the Ground with Plants, that they are almoſt all ſtarved and good for nothing.

People are generally prepoſſeſſed with the Opinion, that their own Cuſtoms and Ways are beſt.

§ 10. We know that Huſbandry is much better managed now in ſome Countries than it is in others; and in *England* Men go about it more ſkilfully in ſome Parts than they do in others: And yet the native Inhabitants of every Country will perſiſt in it, that their Practice is wiſer and better than that of any other Part of the World. It was but in the Age laſt paſt, that in ſome Parts of *Ireland* they made their Horſes draw by their Tails, and the Inhabitants of thoſe Parts would inſiſt upon it, and diſpute it to the Death, that drawing by the Tail was the right, proper, and natural Way for all Horſes to draw. Nevertheleſs, theſe People were not, as ſome ſuppoſe, more ſtupid, or of leſs Sagacity or Underſtanding than other Men: But it is the natural Bias of all Men every where to be prejudiced in Favour of the Cuſtoms that have long prevailed in their Country, and which they were taught in their Youth; they take it for a Point certain, that their Fathers have found out the beſt Ways that could be invented or diſcovered; and it ſeems to be a Sort of Affront to them and their Anceſtors, to ſuppoſe, that the People of any other Country could ever be wiſer or cleverer than they. Nor let any one ſay or think, that the different Practices of Agriculture in different Parts are neceſſary, becauſe of the Difference of the Soil, and the different Sorts of Land: This is much talked of, but really very little conſidered. Earth is Earth all over the World, and Sand, Chalk, Clay, Gravel, Loam, *&c.* are the ſame in *Yorkſhire*, in *Kent*, or in *Somerſetſhire.* Hills are generally dryer than Valleys, and ſo wet Land is wet Land, and dry Land is dry Land every where; and, ſome Peculiarities excepted, the Nature of the Land is the ſame every where. And to ſuppoſe that Men have every where found out the beſt and wiſeſt Practices of Huſbandry is as unreaſonable, as to ſuppoſe that Men have every where made the greateſt Improvements in Mathematicks, Navigation, and every other Art, or uſeful Branch of Knowledge; which would not only be a moſt abſurd and irrational Suppoſition, but contrary to the known Experience of all Men that have ſeen any thing of the World. And every Man, who has ever been fifty Miles from his own Home, muſt have ſeen different Practices in Agriculture, and if Gentlemen who travel, either in *England* or abroad, thought it worth their while to obſerve, or regard ſo mean a Part of Knowledge, they would ſee a great deal of Difference between the Sagacity and Contrivance in the Huſbandry of ſome Parts, beyond that of other Places. If a Farmer happen to ride to ſome Fair forty or fifty Miles from his own Habitation, he may have an Opportunity to obſerve ſome Practices different from his own; and he will readily find out, that ſome of them are not ſo ſenſible and clever as the Cuſtoms of his own Neighbourhood; but that any of them are wiſer or better, he cannot poſſibly believe, for he has already ſettled that Point before, and he is abſolutely certain, that the beſt and wiſeſt Ways are the Practices of his own Country, and the Neighbourhood or particular Place where he was born and brought up.

The Practice of Huſbandry has formerly been in the Hands of more ſpeculative Men.

§ 11. If thirty, ſixty, and an hundred fold Increaſe was a uſual Produce in former Times (as it evidently appears by Experience that it would be the ſame now upon good Ground well managed) and the uſual Increaſe the Farmers make in theſe Times is but ten or twelve fold, then I may venture to ſay, that Agriculture ſeems to have been better underſtood and practiſed heretofore, than it is now. And no doubt but in Times paſt, when Agriculture was not ſunk into that Contempt which it has now been for ſeveral Ages; in thoſe Times, when it was thought no Diſgrace to a Gentleman, even to Lords and Princes to cultivate their own Lands; when a Senator of *Rome* thought it no Diſhonour, nor Diminution of his Greatneſs, to lay his Hand to the Plough; when a Dictator was called from his Plough, to undertake immediately the moſt important Affairs of the State; certainly Agriculture was then managed and carried on by more intelligent Men than it is now. And I ſuppoſe, in thoſe Times, when Men better educated were employed in Huſbandry, the natural Increaſe of Corn was better known and underſtood than it is now.

CHAP. II. *Of the preſent Practice of furrowing Corn.*

Of furrowed Beans.

§ 1. It is certain however, that ſome Improvements have been made in the preſent Age, which were not known or conſidered in the laſt. Sowing Beans in Rows or Furrows, and hoing and ſhimming between them, in the Manner that is now practiſed in theſe Parts of *Kent* and elſewhere, is a Method that in the Corn Fields was not known in the laſt Age: In Gardens 'tis probable it may have been practiſed much longer; but in the Fields it is a Practice of late Date, within the Memory of ſome Men now living, as I am told; and many Men in theſe Parts have heard their Fathers talk of it as a new Thing. And thoſe, who had been uſed to the old Way of ſowing their Beans at random, would not for many Years believe, that Beans thus put in Furrows could produce ſo good a Crop, as when ſown at random all over the Ground. This furrowing ſeemed to them to be ſowing but half the Land, and conſequently they thought could bring but half a Crop. But now there are no Men in theſe Parts but what are fully convinced, by many Years Experience, that not only as good Crops are produced this Way, but what is yet more material, the Summer Tillage, which is performed by ſhimming and hoing, is ſuch a Preparation for a ſucceeding Crop, that they have much better Crops of Wheat after Beans managed in this Way, than they could obtain before this Method of furrowing was practiſed.

Of furrowed Wheat.

§ 2. It is alſo now (and has been for ſome few Years paſt) the Practice of ſome Farmers to furrow their Wheat. And this Method, where they are diligent in hoing and killing of Weeds, is ſome Improvement to the Land; and they who practiſe it, find by Experience that they get as good Crops, as when they uſed to ſow at random. But this is what many old Farmers will never be perſuaded to believe; ſuch is the Force of Prejudice.

This not to be compared to Horſe-hoing.

§ 3. But this Practice is in no Degree comparable to Horſe-hoing, for this at beſt is but ſcratching a little of the Top of the Ground, and killing a few of the Weeds; and that only in the Beginning of the Spring, for by the Middle of *May* they are ſhut out from doing any more to it, except cutting a few Thiſtles, and pulling out ſome of the talleſt Weeds, ſuch as over-top the Wheat: But for all the vaſt Stock of under Weeds, they are but little concerned about them; if they can but keep them from ſhewing themſelves above the Corn, they think all is well. And yet a Crop of Wheat may be impoveriſhed and diminiſhed one third Part by a Crop of under Weeds which never appear above the Wheat: But for what the Roots of theſe Weeds are doing under ground, or what they feed upon within the Surface of the Earth, this is very little conſidered, if the Branches don't appear to hinder the Corn above Ground. But the Horſe-hoing deſtroys Weeds above and under Ground, Root and Branch, and performs the Summer Tillage to a good Depth; which is a Preparation, or laying in of Proviſion for ſucceeding Crops even for many Years to come.

They put their Furrows too near together.

§ 4. Further I muſt obſerve here, that thoſe Farmers who do furrow Wheat, are generally ſo unſkillfully greedy, that they do not allow half Room enough to perform their ſhimming and hoing, and ſuch little ſcratching Tillage to good Purpoſe; for they generally ſtrike ſixteen or ſeventeen Furrows to the Breadth of ſixteen Foot and a half: That is, in their Way of ſpeaking, they go ſixteen [redacted] to the Rod. This, conſidering the ſpreading of the Wheat in the Furrows, does not leave above ſeven or eight Inches clear Partition; and if they go but fourteen or fifteen to the Rod, they are afraid of hurting themſelves, and leſſening the Crop; and yet conſidering the ſpreading of the Furrow, there will then be not above nine or ten Inches clear Partition, for hoing and killing of Weeds. Whereas in furrowed Beans they go but eleven to the Rod, and the Beans ſpreading leſs in the Furrows, there is commonly fifteen or ſixteen Inches clear Partition for ſhimming, hoing, and killing of Weeds.

But Wheat ſhould be allowed more Room than Beans.

§ 5. And yet if Reaſon was at all to be conſulted in this Caſe, it would teach us that Rows of Wheat Plants require more Room and Diſtance, than Rows or Furrows of Beans; for the natural Increaſe of a ſingle Bean is in no Proportion to that of a ſingle Grain of Wheat. A Plant from a ſingle Bean, ſtanding ſingle in the beſt Ground, will rarely produce above an hundred fold Increaſe; I believe three hundred was ſcarce ever ſeen, at leaſt I have never ſeen any thing like it: But a Plant of Wheat from a ſingle Grain, ſtanding ſingle in good Ground, will produce above a thouſand. And the Roots of ſuch a Plant of Wheat will ſpread farther in the Ground, and the Plant will grow larger, ſpread more, and take up more Room above Ground, than a Bean.

This will hardly be believed by thoſe who have not carefully obſerved it; for a ſingle Plant of a Bean is no uncommon Thing, and many have ſeen them in Gardens grow to great Perfection; but very few have ſeen a large and thriving ſingle Plant of Wheat. But from ſome Experiments lately made it is certain, that a ſingle Plant of Wheat will grow much larger, and take up more Room than any Plant of a Bean: And conſequently Rows or Furrows of Wheat ſhould have more Room allowed them, and be put at further Diſtance than Beans. This ſhould be the Caſe, if Reaſon were to be conſulted about it; but Men ſeldom venture to aſk their Reaſon any Queſtion that would lead them againſt the Stream of Cuſtom and Opinion.

CHAP. III. *Of the Difficulties & Diſcouragements.*

This Practice is diſapproved by a great Majority.

§ 1. To accidental Obſervations and caſual Experiments, we are indebted for many noble and uſeful Diſcoveries; but many more we owe to the Thought and Contrivance of particular Perſons. There have been Times when Men lived upon Acorns and Berries, or other wild Fruits; and 'tis not unlikely but thoſe who firſt thought of planting and ſowing, were laughed at, and treated with Contempt.—He that gives up his Underſtanding to be led by the Majority of Voices, muſt of courſe declare againſt every Thing that has the Appearance of Novelty; and if the ſame Thing which is at firſt condemned, ſhould afterwards be approved, and get the Majority of its Side, he may ſafely ſhift and be for it, by the ſame Rule that he was againſt it before, and all this without knowing any thing of the Matter, or having any Opinion of his own. Thus many Perſons think it ſafer to follow the Multitude, than to examine and endeavour to find out Truth; for if they ſhould be ever ſo much in the wrong, they are ſure of Numbers to keep them in Countenance. But how many beneficial and excellent Improvements would have been loſt to the World, if the firſt Inventors and Diſcoverers had been utterly diſcouraged in their Proceedings by the Noiſe and Contradictions, and the clamorous Oppoſition of the Ignorant and Incurious. And yet this has been ſuch a Diſcouragement, that ſome Perſons, who would have been glad to have tried Experiments, have been deterr'd from it by the Dread of this Sort of Clamour and Oppoſition; they could not bear to be laugh'd at by thoſe with whom they uſually kept company. This indeed can be no Diſcouragement to a Gentleman in good Circumſtances, becauſe the uſual Company ſuch a Perſon comes into, if they do oppoſe him, it will generally be with Arguments that have ſome Appearance of Reaſon, and always with Civility and good Manners. But for a ſubſtantial Farmer, who happens to have a better Underſtanding than his Neighbours, and whoſe Buſineſs ſometimes calls him to Markets and Places where the Ignorant and Poſitive get into his Company, and ſuch as theſe, when they are a little animated with Liquor, will be teazing him with Noiſe and Nonſenſe, without any thing like Reaſon or Argument; it will require no ſmall Stock of Patience and Reſolution to bear with all this Clamour and Impertinence.

But no rational Arguments are offer'd againſt it.

§ 2. And of all that has been ſaid againſt this Practice, I have not heard of any thing like an Argument of Reaſon. *It won't do*, ſay they; but if you aſk, Pray, Sir, why won't it do? *Why,—becauſe I know it won't do; what, don't I know? have I been in Buſineſs ſo many Years, and*

and tried every Thing that can be tried? And ſure I know, and I tell you it won't do. But, Sir, it has been tried in this Neighbourhood; a Crop of Turnips have been raiſed in this Way, which proved a very good Crop; and the Land is viſibly improved by the Tillage that was performed with the Hoe-plough, while the Turnips were growing. *Pough, don't tell me of Turnips, there is a great deal of Difference between Turnips and Wheat. What do you talk of Turnips, it may do once or ſo for Turnips; but I tell you it won't do for Wheat.*— But, Sir, it has been tried for Wheat.—*Ay ſo it has, and ſome of your Wheat put in this Way, what was it good for? It wan't half a Crop. Some of it wan't worth harveſting. I tell you it won't do, and all that go this Way to work will be ruin'd: You'll ſee 'em all break in a Year or two, I tell you ſo; I know it won't do.* But, Sir, why ſhould you be ſo angry? have a little Patience. I acknowledge as you ſay, there was ſome Wheat and Barley that was put in ſomething like this Way, that was but a poor Crop indeed; but that was neither put in right, nor managed right after it was put in, nor was the Land in any Degree of Tillage fit for it. But there were others who managed it better, and had a tolerable Crop, nay an extraordinary Crop, conſidering it was the firſt Attempt, and very imperfectly performed; there was an Increaſe of near forty fold of the Seed that was ſown, upon ſome whole Acres. And there is Wheat now growing in this Way, which is better managed, and which now makes a much better Appearance than any within ſome Miles of it, and in all Probability muſt produce a very good Crop. *Pough,—don't tell me. I won't believe it. I know it will come to nothing; you ſhall ſee at Harveſt it won't be half a Crop. What, don't I know? I tell you it won't do, I know it won't do.* Theſe are the Sort of Arguments uſually brought againſt this new-faſhioned Huſbandry (as ſome of them call it.) And whoever can approve of this Way of Reaſoning, I ſhall leave them to enjoy it, while I proceed to ſum up the Arguments on the other Side, in a few Words.

§ 3. Upon the whole we may venture to ſay, that the Succeſs of the *Horſe-hoing Huſbandry* is fully and demonſtratively proved from Reaſon and Experience; and the Proof of it ſtands thus:

Recapitulation.

Firſt, Reaſon and Experience prove, that continual Summer Tillage is a great Improvement to all Sorts of Land, and the more Summer Tillage is beſtow'd upon Land, it is always found to be more rich and fertile, and brings all Sorts of Plants to greater Perfection.

Secondly, Reaſon and Experience prove, that all Plants will come to a greater Perfection of Growth, when ſet at proper Diſtances, in proportion to the Bulk of the Plants; but when crowded too near, they only hinder and ſtarve one another.

Thirdly, Reaſon and Experience prove, that a ſingle Grain of Wheat will make a Plant many Times bigger, and produce an Increaſe abundantly more than is generally known and obſerved.

Fourthly, Reaſon and Experience prove, that Wheat in the Fields may be ſowed in Rows, at ſuch proper Diſtances as to admit of Summer Tillage while the Corn is growing; by which the Plants may be brought to ſuch Perfection of Growth, as to produce an Increaſe of ſixty or an hundred fold: Whereas in the common Practice of Huſbandry, it never brings twenty fold.

From theſe Propoſitions, I think the Concluſion is certain and undeniable, *viz.* That the Methods of Huſbandry, here recommended, are demonſtratively proved, both by Reaſon and Experience, to be more ſucceſsfull and profitable, than the Methods of Huſbandry now commonly practiſed.

And in many Caſes of great Importance, even Caſes that affect our Liberties, our Properties, and our Lives; we have great Reaſon to wiſh, that the Proofs and Evidences, on which Men proceed, were capable of being as clear and certain as theſe.

But in many ſuch Caſes we muſt be contented with Probability; where Certainty cannot be had, we muſt be determined by ſuch Proof and Evidence as can be had, which yet in many Caſes may poſſibly deceive us.

Yet in this Caſe the Proofs are certain and ſelf-evident; they are to be demonſtrated by Number, Weight, and Meaſure, which amounts to the higheſt Degree of certain Knowledge, that any Thing in this World is capable of.

Concluſion.

§ 4. Whoſoever finds himſelf inclined to try this Method of Huſbandry, I would adviſe him, for the firſt Year to content himſelf with making the Experiment only upon one or two Acres of Land; for he who fancies, he ſhall know how to go to Work, and that he ſhall manage it right, the firſt Year, will be very likely to find himſelf miſtaken; and if he ventures to make his firſt Trial upon a large Quantity of Land, his Loſs may be conſiderable the firſt Year.

And, as Mr. *Tull* has ſaid, he that goes too raſhly into it, may probably go as raſhly out of it, without any good Reaſon for the one or the other. For tho' the Succeſs be certain, if the Practice be well performed; yet the Beginner, let him be ever ſo perfect in the Theory, will find himſelf not very expert in the Practice at his firſt ſetting out, and it will probably be a Year or two before he will get his Servants to come readily and willingly into the Performance of it; therefore by thus entering upon it by Degrees, he will find it abundantly more eaſy, than if he encumbers himſelf with too much of it at firſt.

§ 5. Another Caution for the Beginner may be proper, concerning the Quantity of Seed for an Acre: This was the chief Error that was committed in the Practice of laſt Year. There was one Piece of eight Acres ſowed with Wheat, and but two Buſhels of Seed ſowed upon the whole Piece, which was but a Peck to an Acre. This had the Misfortune to be very much blaſted, otherwiſe (tho' it was ſo greatly under-ſeeded) it made an Appearance for an extraordinary Crop; but this ſhould have been allowed at leaſt ſix Gallons of Seed *per* Acre. The Blaſting of this Piece of Wheat was no ſmall Diverſion to ſome Perſons, who had very poſitively and with much Vehemence affirmed and ſwore that it never could produce a Crop: But when they ſaw it out in Ear, and ſuch a prodigious Appearance of large Ears, and in all reſpects ſuch an extraordinary Growth as had ſcarce ever been ſeen, they began to ſtagger, and ſeemed really afraid that they ſhould find themſelves miſtaken, and ſee a good Crop produced from a Peck of Seed to an Acre; ſome of them began to talk with a little more Modeſty and Doubting; but ſome continued to affirm confidently and ſwear heartily, that it would all be lodged, or ſomething or other would happen to it, and it could never be a Crop. And therefore when they ſaw that it would not fall, and be lodged, as they had ſwore it would, it was ſome Comfort to them to ſee it very much blaſted, a little before Harveſt: This ſaved them at leaſt till another Harveſt before they ſhould be driven to the Vexation of acknowledging their Ignorance.

There was another Piece of eight Acres ſowed with about half a Buſhel of Wheat to the Acre; this being not in ſo good Tillage as the other, it brought but a little above thirty fold Increaſe. This ſhould have been allowed a Buſhel of Seed to the Acre. By theſe and other Trials we find that the Quantity of Seed to each Acre ſhould be different, according to the different Condition the Land is in; for good Land in a good Degree of Tillage, ſix Gallons of Wheat is enough; but if the Land be poor and not in good Tillage, two Buſhels may not be too much the firſt Year; for before the Land has had one Summer's Tillage, the Roots of the Corn will have very little Benefit of the Earth in the Intervals, and it is unreaſonable to expect the Benefit of Tillage before the Tillage is performed.

§ 6. It has been ſomewhat diverting in the Courſe of this laſt Year's Practice, to hear the various Conjectures, and contrary Opinions, of thoſe who have pleaſed themſelves with talking and gueſſing about it, tho' they have no Notion of the Rationale or fundamental Principles upon which the Practice is grounded. Many have agreed that it won't do, tho' ſcarce any two of them can agree why or wherefore it won't do. And we find a great many, who think it right to make their Eſtimate of the future Succeſs from the worſt Part of the Succeſs of this laſt Year; the worſt, they think, ſhould conclude for the whole, and the beſt they account for, as the Atheiſts account for the Production of all Things, that is, by Chance and Accident. But whoever gives himſelf the Trouble of reading this Abſtract, may have ſomething to ſay to ſuch Perſons as entertain a doubtful Opinion of it, only for want of knowing the Grounds and Reaſons; and alſo to thoſe who, thro' an odd kind of Prejudice, are continually railing againſt it, they don't know why, and tho' they are not able to offer one rational Argument about it.

FINIS.